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Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2006

Appendix A: Database Details and Calculation Methods

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List of Appendixes

Harmonically Averaging Fuel Economy Values

Dimensionally, fuel economy is miles divided by gallons. Then, presented with more than one fuel economy value, an approach to averaging the values is to compute the result by determining the total miles traveled and dividing that by the total gallons used.

Example: A motorist's fuel economy log for May shows that 704 miles were accumulated around town in which the fuel economy was 16 mpg, and one 216 mile trip was taken on which the fuel economy was 24 mpg. What is the average fuel economy for May?

The total miles are 704 + 216 = 920. The total gallons thus are 704 / 16 = 44 plus 216 / 24 = 9; 53 gallons. The average mpg is 920 / 53 = 17.4 mpg. Notice that the arithmetic average of the two fuel economy values (16 + 24) / 2 = 20 mpg gives an individual result which is higher than the total miles/total gallons result.

Even if the around-town miles traveled and the trip-miles traveled were the same (460 miles), the average fuel economy would not be 20; it would be 19.2 mpg. This is because in the total miles/total gallons approach, *fuel consumption* is arithmetically averaged, but *fuel economy* is harmonically averaged, so for the second example (equal trip distances), the calculation would be:

Average MPG = 2 / (1/16 + 1/24) = 19.2 MPG,

which is the same as arithmetically averaging the two fuel consumption values.

A specific example of this type of averaging approach is shown in the calculation of the overall average fuel economy using the EPA "city" (MPG_C) and EPA "highway" (MPG_H) fuel economy values.

$$\text{Average MPG} = \frac{\text{Total Miles}}{\text{Total Gallons}}$$

$$= \frac{\text{Total Miles}}{\text{City Gallons} + \text{Highway Gallons}}$$

$$= \frac{\text{Total Miles}}{\text{City Miles/City MPG} + \text{Highway Miles/Highway MPG}}$$

Now, if city miles are 55 percent of total miles and highway miles are the remaining 45 percent, after dividing by total miles,

$$\text{Average MPG} = \frac{1}{(.55/\text{MPG}_{\mathbf{C}}) + (.45/\text{MPG}_{\mathbf{H}})}$$

and this average mpg is called the EPA 55/45 MPG value.

The same approach can be used when the average mpg of a group of vehicles with different mpg values is to be calculated. Suppose a fleet of 100,000 vehicles is made up of two classes, one of 70,000 vehicles whose fuel economy is 10 mpg and the other of 30,000 vehicles whose fuel economy is 14 mpg. Each vehicle in the fleet is assumed to travel the same number of miles (**M**),

$$\text{Total Miles} = 100{,}000\ \mathbf{M}$$

$$\text{Total Gallons} = 70{,}000\ \mathbf{M} / 10 + 30{,}000\ \mathbf{M} / 14$$

and the average fuel economy is:

$$\text{Average Fuel Economy} = \frac{1}{.7/10 + .3/14}$$

$$= 10.9 \text{ mpg}$$

where .7 and .3 are the relative shares of each vehicle class in the fleet. Notice that, again, the arithmetic average of the class fuel economy values (10 + 14)/2 = 12 mpg is higher.

In general, some form of a weighted harmonic mean is used when averaging different fuel economy values.

Estimated and Final Sales Data

Table A-1 compares average 55/45 laboratory fuel economy for model years 1998 through 2004 at three points in time:

(1) an initial estimate determined early in each model year using just projected sales,

(2) a revised estimate determined by using trade publication sales data that were obtained after the end of each model year, but before the data used for the CAFÉ calculations were submitted to the Federal Government, and

(3) final fuel economy values determined from compliance data provided by the manufacturers to the Federal Government after the end of the model year.

Over the past five years, the final fuel economy values have varied from .4 mpg lower to .3 mpg higher compared to the original estimates based exclusively on estimated sales. The next report in this series will provide updated data for model years 2005 and 2006 based on information available at that time

Table A-1

Comparison of Laboratory 55/45 MPG

	Model Year	Initial Estimate	Revised Estimate	Final Value
Cars	1998	28.6	28.6	28.5
	1999	28.1	28.2	28.1
	2000	28.1	28.3	28.2
	2001	28.3	28.3	28.4
	2002	28.5	28.5	28.6
	2003	29.0	28.9	28.9
	2004	28.7	28.9	28.9
Trucks	1998	20.6	20.6	20.9
	1999	20.3	20.4	20.5
	2000	20.5	20.5	20.8
	2001	20.3	20.4	20.6
	2002	20.4	20.3	20.6
	2003	20.8	20.9	20.9
	2004	20.9	20.9	20.8
Both	1998	24.4	24.4	24.5
	1999	23.8	24.0	24.1
	2000	24.0	23.9	24.3
	2001	23.9	24.0	24.2
	2002	24.0	23.9	24.1
	2003	24.4	24.2	24.3
	2004	24.4	24.4	24.0

Use of 3-Year Moving Averages

Use of the three-year moving averages, which effectively smooth the trends, results in an improvement in discerning real trends from what might be relatively small year-to-year variations in the data. For this report, as shown in Table A-2, these three-year moving averages are tabulated at the midpoint. For example, the midpoint for model years 2002, 2003, and 2004 is MY2003.

Table A-2

Light-Duty Vehicle Laboratory Fuel Economy and Truck Sales Fraction

	Actual Data				Three-Year Moving Average			
	55/45 Fuel Economy			Truck	55/45 Fuel Economy			Truck
Year	Cars	Trucks	Both	Sales Fraction	Cars	Trucks	Both	Sales Fraction
1975	15.8	13.7	15.3	.194				
1976	17.5	14.4	16.7	.212	17.1	14.5	16.5	.202
1977	18.3	15.6	17.7	.200	18.5	15.1	17.6	.213
1978	19.9	15.2	18.6	.227	19.4	15.2	18.3	.216
1979	20.3	14.7	18.7	.222	21.1	16.0	19.8	.205
1980	23.5	18.6	22.5	.165	22.8	17.5	21.5	.187
1981	25.1	20.1	24.1	.173	24.8	19.7	23.7	.178
1982	26.0	20.5	24.7	.197	25.7	20.5	24.5	.197
1983	25.9	20.9	24.6	.223	26.1	20.6	24.6	.219
1984	26.3	20.5	24.6	.239	26.4	20.6	24.7	.239
1985	27.0	20.6	25.0	.254	27.0	20.8	25.1	.258
1986	27.9	21.4	25.7	.283	27.6	21.2	25.5	.272
1987	28.1	21.6	25.9	.278	28.2	21.4	25.8	.286
1988	28.6	21.2	25.9	.298	28.3	21.2	25.8	.294
1989	28.1	20.9	25.4	.307	28.2	20.9	25.5	.302
1990	27.8	20.7	25.2	.302	28.0	21.0	25.3	.310
1991	28.0	21.3	25.4	.322	27.8	20.9	25.2	.319
1992	27.6	20.8	24.9	.334	27.9	21.0	25.1	.339
1993	28.2	21.0	25.1	.360	28.0	20.8	24.8	.366
1994	28.0	20.8	24.6	.404	28.2	20.7	24.8	.381
1995	28.3	20.5	24.7	.380	28.2	20.7	24.7	.395
1996	28.3	20.8	24.8	.400	28.3	20.7	24.7	.401
1997	28.4	20.6	24.5	.424	28.4	20.8	24.6	.424
1998	28.5	20.9	24.5	.449	28.4	20.7	24.4	.441
1999	28.2	20.5	24.1	.449	28.3	20.7	24.3	.449
2000	28.2	20.8	24.3	.449	28.3	20.6	24.2	.453
2001	28.4	20.6	24.2	.461	28.4	20.6	24.2	.465
2002	28.6	20.6	24.1	.485	28.7	20.7	24.2	.481
2003	28.9	20.9	24.3	.496	28.8	20.8	24.1	.500
2004	28.9	20.8	24.0	.520	29.0	21.0	24.3	.506
2005	29.2	21.2	24.6	.500	29.0	21.2	24.4	.508
2006	28.8	21.5	24.6	.504	****	****	****	****

Table A-2 (Continued)

Light-Duty Vehicle Adjusted Fuel Economy

Cars

Model Year	Each Year's Data CITY	HWY	55/45	3 Year Moving Avg. CITY	HWY	55/45
1975	12.3	15.2	13.5	****	****	****
1976	13.7	16.6	14.9	13.4	16.3	14.6
1977	14.4	17.4	15.6	14.5	17.6	15.8
1978	15.5	19.1	16.9	15.3	18.5	16.6
1979	15.9	19.2	17.2	16.5	20.2	18.0
1980	18.3	22.6	20.0	17.8	21.8	19.4
1981	19.6	24.2	21.4	19.3	24.1	21.2
1982	20.1	25.5	22.2	19.8	25.1	21.9
1983	19.9	25.5	22.1	20.1	25.7	22.2
1984	20.2	26.0	22.4	20.3	26.1	22.5
1985	20.7	26.8	23.0	20.7	26.8	23.1
1986	21.3	27.7	23.8	21.1	27.5	23.6
1987	21.5	28.0	24.0	21.5	28.1	24.1
1988	21.8	28.5	24.4	21.6	28.3	24.1
1989	21.4	28.3	24.0	21.4	28.3	24.1
1990	21.1	28.1	23.7	21.2	28.2	23.9
1991	21.2	28.3	23.9	21.0	28.2	23.8
1992	20.8	28.3	23.6	21.1	28.5	23.9
1993	21.3	28.8	24.1	21.0	28.6	23.9
1994	21.1	28.8	24.0	21.2	29.0	24.1
1995	21.2	29.3	24.2	21.2	29.1	24.1
1996	21.2	29.3	24.2	21.2	29.4	24.2
1997	21.3	29.4	24.3	21.3	29.4	24.3
1998	21.3	29.6	24.4	21.2	29.4	24.3
1999	21.1	29.2	24.1	21.2	29.3	24.2
2000	21.1	29.1	24.1	21.2	29.2	24.2
2001	21.4	29.3	24.3	21.4	29.2	24.3
2002	21.6	29.3	24.5	21.6	29.4	24.5
2003	21.8	29.7	24.7	21.7	29.6	24.6
2004	21.7	29.8	24.7	21.8	29.8	24.8
2005	22.0	30.0	25.0	21.8	29.8	24.8
2006	21.6	29.6	24.6	****	****	****

Table A-2 (Continued)

Light-Duty Vehicle Adjusted Fuel Economy

Trucks

Model Year	Each Year's Data			3 Year Moving Avg.		
	CITY	HWY	55/45	CITY	HWY	55/45
1975	10.9	12.7	11.6	****	****	****
1976	11.5	13.2	12.2	11.7	13.3	12.3
1977	12.6	14.1	13.3	12.2	13.7	12.8
1978	12.4	13.7	12.9	12.4	13.6	12.9
1979	12.1	13.1	12.5	13.0	14.4	13.6
1980	14.8	17.1	15.8	14.1	15.9	14.9
1981	16.0	18.6	17.1	15.7	18.2	16.7
1982	16.3	19.0	17.4	16.3	19.1	17.4
1983	16.5	19.6	17.8	16.3	19.3	17.5
1984	16.1	19.3	17.4	16.3	19.4	17.6
1985	16.2	19.4	17.5	16.4	19.6	17.7
1986	16.9	20.2	18.3	16.7	20.1	18.1
1987	16.9	20.7	18.4	16.8	20.4	18.2
1988	16.5	20.4	18.1	16.6	20.4	18.1
1989	16.3	20.1	17.8	16.3	20.2	17.8
1990	16.1	20.2	17.7	16.3	20.3	17.9
1991	16.4	20.7	18.1	16.2	20.4	17.8
1992	16.1	20.4	17.8	16.2	20.6	17.9
1993	16.1	20.7	17.9	16.1	20.5	17.8
1994	16.0	20.3	17.7	16.0	20.4	17.7
1995	15.8	20.2	17.5	15.9	20.4	17.7
1996	16.0	20.7	17.8	15.9	20.4	17.6
1997	15.8	20.4	17.6	15.9	20.6	17.7
1998	16.0	20.8	17.8	15.8	20.5	17.6
1999	15.7	20.3	17.5	15.9	20.5	17.7
2000	16.0	20.5	17.7	15.8	20.3	17.6
2001	15.9	20.2	17.6	15.9	20.3	17.6
2002	15.8	20.3	17.6	15.9	20.4	17.7
2003	16.0	20.7	17.8	15.9	20.5	17.7
2004	15.9	20.6	17.7	16.0	20.8	17.9
2005	16.2	21.2	18.1	16.2	21.1	18.1
2006	16.4	21.5	18.4	****	****	****

Table A-2 (Continued)

Light-Duty Vehicle Adjusted Fuel Economy

Cars and Trucks

Model Year	Each Year's Data			3 Year Moving Avg.		
	CITY	HWY	55/45	CITY	HWY	55/45
1975	12.0	14.6	13.1	****	****	****
1976	13.2	15.7	14.2	13.0	15.6	14.1
1977	14.0	16.6	15.1	13.9	16.6	15.0
1978	14.7	17.5	15.8	14.5	17.2	15.6
1979	14.9	17.4	15.9	15.6	18.6	16.8
1980	17.6	21.5	19.2	16.9	20.3	18.3
1981	18.8	23.0	20.5	18.5	22.8	20.2
1982	19.2	23.9	21.1	19.0	23.6	20.8
1983	19.0	23.9	21.0	19.1	23.9	21.0
1984	19.1	24.0	21.0	19.1	24.1	21.1
1985	19.3	24.4	21.3	19.4	24.5	21.4
1986	19.9	25.1	21.9	19.7	25.0	21.8
1987	20.0	25.5	22.1	19.9	25.4	22.0
1988	19.9	25.5	22.1	19.8	25.4	22.0
1989	19.5	25.2	21.7	19.6	25.3	21.8
1990	19.3	25.1	21.5	19.4	25.2	21.6
1991	19.4	25.3	21.7	19.2	25.2	21.5
1992	18.9	25.0	21.3	19.1	25.2	21.5
1993	19.1	25.2	21.4	18.9	25.0	21.2
1994	18.7	24.7	21.0	18.8	25.0	21.2
1995	18.8	25.0	21.1	18.7	24.9	21.1
1996	18.7	25.1	21.2	18.7	25.0	21.1
1997	18.6	24.8	20.9	18.6	24.9	21.0
1998	18.5	24.9	20.9	18.5	24.7	20.8
1999	18.3	24.4	20.6	18.4	24.6	20.8
2000	18.4	24.5	20.7	18.4	24.4	20.7
2001	18.4	24.3	20.7	18.4	24.3	20.7
2002	18.3	24.1	20.6	18.4	24.3	20.7
2003	18.5	24.4	20.8	18.3	24.2	20.6
2004	18.2	24.2	20.5	18.5	24.5	20.8
2005	18.7	24.8	21.0	18.5	24.6	20.8
2006	18.6	24.9	21.0	****	****	****

Vehicle Classification Exceptions

The truck size classification scheme used in this report is based primarily on published wheelbase data. For cars, vehicle classification as to vehicle type, size class, and manufacturer/ origin generally follows fuel economy label, *Fuel Economy Guide*, and fuel economy standards protocols; exceptions are listed in Table A-3. The classification of a vehicle for this report is based on the author's engineering judgment and is not a replacement for definitions used in implementing automotive standards legislation.

Table A-3

Group/Manufacturer/Vehicles		Years	Are Classified As:
DC:	Chrysler Colt 4WD Wagon	All	Small Wagon
DC:	Chrysler Colt Vista	All	Small Van
DC:	Chrysler Pacifica	All	Large Wagon
DC:	Chrysler PT Cruiser	All	Small Wagon
DC:	Chrysler PT Cruiser Convertible	All	Subcompact
DC:	R-Series	All	Large Wagon
DC:	Chrysler Summit Wagon	All	Small Van
DC:	Dodge Ramcharger	All	Car
DC:	Dodge Magnum	All	Midsize Wagon
DC:	Eagle 4WD Wagon	All	Car
DC:	Mitsubishi Expo	All	Small Van
DC:	Mitsubishi Space Wagon	All	Small Van
Ford:	Ford Pinto Van	All	Car
Ford:	Volvo V70 XC	All	Midsize Wagon
GM:	HHR	All	Small Wagon
GM:	Isuzu Oasis	All	Midsize Van
GM:	Pontiac Vibe	All	Small Wagon
GM:	Subaru 4WD Sedans/Wagons	All	Cars
GM:	Subaru Forester	All	Small SUV
GM:	Subaru Baja	All	Small Pickup
GM:	Suzuki X-90	All	Small SUV
Toyota:	Lexus RX300	All	Midsize SUV
Toyota:	Matrix	All	Small Wagon
VW:	Audi Allroad	All	Midsize Wagon

Comparison of EPA and NHTSA Data

Table A-4 compares CAFE data reported by the National Highway Traffic Safety Administration (NHTSA) with the adjusted and unadjusted (laboratory) fuel economy data in this report. The NHTSA values in Table A-4 are higher than the unadjusted mpg values by up to .9 mpg due to differences in vehicle classification, test procedure adjustment factors and alternative fuel credits. The NHTSA data for MY1979 trucks in this table is just for vehicles up to 6000 pound GVW; but for all other years the NHTSA data includes vehicles up to 8500 GVW. The EPA data for all years in the table includes vehicles up to 8500 GVW. In addition, the EPA data in the table is final through MY2004, but preliminary for MY2005 and MY2006.

Table A-4

EPA Adjusted, Laboratory, and NHTSA CAFE Fuel Economy Values by Model Year

	Cars				Trucks				Both Cars and Trucks			
Model Year	EPA Adj.	EPA Unadj.	NHTSA (CAFE)	Diff.	EPA Adj.	EPA Unadj.	NHTSA (CAFE)	Diff.	EPA Adj.	EPA Unadj.	NHTSA (CAFÉ)	Diff.
1975	13.5	15.8	n/a		11.6	13.7	n/a		13.1	15.3	n/a	
1976	14.9	17.5	n/a		12.2	14.4	n/a		14.2	16.7	n/a	
1977	15.6	18.3	n/a		13.3	15.6	n/a		15.1	17.7	n/a	
1978	16.9	19.9	19.9	.0	12.9	15.2	n/a		15.8	18.6	n/a	
1979	17.2	20.3	20.3	.0	12.5	14.7	18.2		15.9	18.7	20.1	
1980	20.0	23.5	24.3	.8	15.8	18.6	18.5	-.1	19.2	22.5	23.1	.6
1981	21.4	25.1	25.9	.8	17.1	20.1	20.1	.0	20.5	24.1	24.6	.5
1982	22.2	26.0	26.6	.6	17.4	20.5	20.5	.0	21.1	24.7	25.1	.4
1983	22.1	25.9	26.4	.5	17.8	20.9	20.7	-.2	21.0	24.6	24.8	.2
1984	22.4	26.3	26.9	.6	17.4	20.5	20.6	.1	21.0	24.6	25.0	.4
1985	23.0	27.0	27.6	.6	17.5	20.6	20.7	.1	21.3	25.0	25.4	.4
1986	23.8	27.9	28.2	.3	18.3	21.4	21.5	.1	21.9	25.7	25.9	.2
1987	24.0	28.1	28.5	.4	18.4	21.6	21.7	.1	22.1	25.9	26.2	.3
1988	24.4	28.6	28.8	.2	18.1	21.2	21.3	.1	22.1	25.9	26.0	.1
1989	24.0	28.1	28.4	.3	17.8	20.9	21.0	.1	21.7	25.4	25.6	.2
1990	23.7	27.8	28.0	.2	17.7	20.7	20.8	.1	21.5	25.2	25.4	.2
1991	23.9	28.0	28.4	.4	18.1	21.3	21.3	.0	21.7	25.4	25.6	.2
1992	23.6	27.6	27.9	.3	17.8	20.8	20.8	.0	21.3	24.9	25.1	.2
1993	24.1	28.2	28.4	.2	17.9	21.0	21.0	.0	21.4	25.1	25.2	.1
1994	24.0	28.0	28.3	.3	17.7	20.8	20.8	.0	21.0	24.6	24.7	.1
1995	24.2	28.3	28.6	.3	17.5	20.5	20.5	.0	21.1	24.7	24.9	.2
1996	24.2	28.3	28.5	.2	17.8	20.8	20.8	.0	21.2	24.8	24.9	.1
1997	24.3	28.4	28.7	.3	17.6	20.6	20.6	.0	20.9	24.5	24.6	.1
1998	24.4	28.5	28.8	.3	17.8	20.9	21.0	.1	20.9	24.5	24.7	.2
1999	24.1	28.2	28.3	.1	17.5	20.5	20.9	.4	20.6	24.1	24.5	.4
2000	24.1	28.2	28.5	.3	17.7	20.8	21.3	.5	20.7	24.3	24.8	.5
2001	24.3	28.4	28.8	.4	17.6	20.6	20.9	.3	20.7	24.2	24.5	.3
2002	24.5	28.6	29.0	.4	17.6	20.6	21.4	.8	20.6	24.1	24.7	.6
2003	24.7	28.9	29.5	.6	17.8	20.9	21.8	.9	20.8	24.3	25.1	.8
2004	24.7	28.9	29.1	.2	17.7	20.8	21.5	.7	20.5	24.0	24.6	.6
2005	25.0	29.2	30.0	.8	18.1	21.2	21.8	.6	21.0	24.6	25.2	.6
2006	24.6	28.8			18.4	21.5			21.0	24.6		

New EPA Fuel Economy Adjustment Proposal

Since the 1970's, EPA has relied on data from two laboratory tests to determine city and highway fuel economy estimates posted on the window stickers of new cars and trucks and published in the *Fuel Economy Guide* and the *Green Vehicle Guide*. In 1985, in order to bring these estimates closer to the values vehicles actually achieve under real world driving conditions, the calculation of these estimates was revised to adjust the city and highway fuel economy estimates downward by 10% and 22%, respectively.

In January 2006, EPA proposed a new 5-cycle approach for determining consumer fuel economy estimates incorporating three additional tests in addition to the city and highway tests. This new proposal will not affect manufacturer CAFÉ values or CAFÉ compliance. The three additional tests, which are currently used only for vehicle emissions certification, would take effect for MY2008. They are:

1) the US06 test which is designed to represent high speed highway driving and aggressive urban driving including rapid accelerations and decelerations,

2) the SC03 test which is designed to represent the impact of air conditioner operation at low vehicle speeds and high temperatures, and

3) the Cold FTP test, which is designed to reflect the impact of cold temperatures during city driving.

For MY2008 through MY2010, two equations, derived from analysis of recent model year data for the five different tests, would be used to calculate equivalent 5-cycle fuel economy estimates:

City FE (derived) = 1. / (.002549 + 1.2259/FTP city)

Hwy FE (derived) = 1. / (.000308 + 1.4030/FTP hwy)

where FTP city and FTP highway are the present laboratory city and highway results.

These equations are equivalent to the five cycle formula for the fleet as a whole, but not necessarily for individual vehicles. In addition, the proposal would require that combined fuel economy for MY2008 and beyond be determined from:

$$MPH_{c/h} = 1 / (.43 / MPG_c + .57 / MPH_h)$$

where MPG_c and MPH_h are the derived city and highway fuel economy values. The proposal thus changes the weighting between the city and highway fuel economy estimates from the current 55% city / 45% highway to 43% city / 57% highway to take into the account the fact that much driving in urban areas is performed under the same high speed conditions as some rural highway driving.

Starting in MY2011, and a compliance option for MY2008 to 2010 at the manufacturer's discretion, the EPA proposal would, in order to develop vehicle specific label estimates based on the 5-cycle formulae, require manufacturers to perform additional cold temperature, air conditioning and/or high speed/rapid acceleration tests for some vehicles that may be more sensitive to these conditions. The 5-cycle fuel economy label formulae combine the results of start fuel use, running fuel use, air conditioning, cold temperature, non-dynamometer effects, and variability.

Tables A-5 to A-7 compare model year 1975 to 2006 average laboratory fuel economy (lab) for cars, trucks and both cars and trucks with the present (adj1) and proposed fuel economy adjustment procedures (adj2). Because only city and highway fuel economy data is available, the proposed adjustment calculation was made for these tables using the derived city and highway equations that were shown previously and which would be used under the proposed regulations for MY2008 to MY2010. EPA expects to publish final regulations for determining fuel economy label values in late 2006. More information about this rulemaking is available at:

http://epa.gov/fueleconomy/regulations.htm

Table A-5

Fuel Economy of 1975 to 2006 Cars

MODEL YEAR	City			Highway			Combined (City/Hwy)		
	Lab	Adj1	Adj2	Lab	Adj1	Adj2	Lab 55/45	Adj1 54/45	Adj2 43/57
1975	13.7	12.3	10.9	19.5	15.2	13.8	15.8	13.5	12.2
1976	15.2	13.7	12.0	21.3	16.6	15.1	17.5	14.9	13.5
1977	16.0	14.4	12.6	22.3	17.4	15.8	18.3	15.6	14.1
1978	17.2	15.5	13.6	24.5	19.1	17.4	19.9	16.9	15.4
1979	17.7	15.9	13.9	24.6	19.2	17.4	20.3	17.2	15.6
1980	20.3	18.3	15.9	29.0	22.6	20.5	23.5	20.0	18.1
1981	21.7	19.6	17.0	31.1	24.2	22.0	25.1	21.4	19.3
1982	22.3	20.1	17.4	32.7	25.5	23.2	26.0	22.2	20.0
1983	22.1	19.9	17.3	32.7	25.5	23.1	25.9	22.1	19.9
1984	22.4	20.2	17.5	33.3	26.0	23.6	26.3	22.4	20.3
1985	23.0	20.7	17.9	34.3	26.8	24.3	27.0	23.0	20.8
1986	23.7	21.3	18.4	35.5	27.7	25.1	27.9	23.8	21.5
1987	23.9	21.5	18.5	35.9	28.0	25.4	28.1	24.0	21.6
1988	24.2	21.8	18.8	36.6	28.5	25.9	28.6	24.4	22.0
1989	23.8	21.4	18.5	36.3	28.3	25.7	28.1	24.0	21.7
1990	23.4	21.1	18.2	36.0	28.1	25.4	27.8	23.7	21.4
1991	23.6	21.2	18.3	36.3	28.3	25.7	28.0	23.9	21.6
1992	23.1	20.8	18.0	36.3	28.3	25.6	27.6	23.6	21.4
1993	23.6	21.3	18.4	36.9	28.8	26.1	28.2	24.1	21.8
1994	23.4	21.1	18.2	36.9	28.8	26.1	28.0	24.0	21.7
1995	23.6	21.2	18.3	37.6	29.3	26.6	28.3	24.2	21.9
1996	23.5	21.2	18.3	37.6	29.3	26.6	28.3	24.2	21.9
1997	23.7	21.3	18.4	37.7	29.4	26.7	28.4	24.3	22.0
1998	23.7	21.3	18.4	37.9	29.6	26.8	28.5	24.4	22.1
1999	23.4	21.1	18.2	37.4	29.2	26.5	28.2	24.1	21.8
2000	23.5	21.1	18.2	37.3	29.1	26.4	28.2	24.1	21.8
2001	23.7	21.4	18.5	37.6	29.3	26.6	28.4	24.3	22.0
2002	24.0	21.6	18.6	37.6	29.3	26.6	28.6	24.5	22.1
2003	24.2	21.8	18.8	38.1	29.7	26.9	28.9	24.7	22.4
2004	24.1	21.7	18.7	38.2	29.8	27.0	28.9	24.7	22.3
2005	24.5	22.0	19.0	38.4	30.0	27.1	29.2	25.0	22.6
2006	24.0	21.6	18.7	38.0	29.6	26.8	28.8	24.6	22.3

Note:

Lab = Laboratory fuel economy
Adj1 = .9 and .78 adjustment factor fuel economy estimate
Adj2 = proposed consumer fuel economy estimate revision

Table A-6

Fuel Economy of 1975 to 2006 Trucks

MODEL YEAR	City			Highway			Combined (City/Hwy)		
	Lab	Adj1	Adj2	Lab	Adj1	Adj2	Lab 55/45	Adj1 54/45	Adj2 43/57
1975	12.1	10.9	9.6	16.2	12.7	11.5	13.7	11.6	10.6
1976	12.8	11.5	10.2	16.9	13.2	12.0	14.4	12.2	11.1
1977	14.0	12.6	11.1	18.1	14.1	12.9	15.6	13.3	12.0
1978	13.8	12.4	10.9	17.5	13.7	12.4	15.2	12.9	11.7
1979	13.4	12.1	10.7	16.8	13.1	11.9	14.7	12.5	11.3
1980	16.5	14.8	13.0	21.9	17.1	15.6	18.6	15.8	14.2
1981	17.8	16.0	14.0	23.9	18.6	16.9	20.1	17.1	15.4
1982	18.1	16.3	14.2	24.4	19.0	17.3	20.5	17.4	15.7
1983	18.3	16.5	14.4	25.2	19.6	17.8	20.9	17.8	16.0
1984	17.9	16.1	14.1	24.8	19.3	17.5	20.5	17.4	15.7
1985	18.0	16.2	14.2	24.9	19.4	17.6	20.6	17.5	15.8
1986	18.8	16.9	14.7	25.9	20.2	18.4	21.4	18.3	16.5
1987	18.8	16.9	14.8	26.5	20.7	18.8	21.6	18.4	16.7
1988	18.3	16.5	14.4	26.2	20.4	18.5	21.2	18.1	16.3
1989	18.1	16.3	14.2	25.8	20.1	18.3	20.9	17.8	16.1
1990	17.8	16.1	14.0	25.9	20.2	18.3	20.7	17.7	16.0
1991	18.3	16.4	14.4	26.6	20.7	18.8	21.3	18.1	16.4
1992	17.8	16.1	14.0	26.2	20.4	18.5	20.8	17.8	16.1
1993	17.9	16.1	14.1	26.5	20.7	18.8	21.0	17.9	16.2
1994	17.8	16.0	14.0	26.1	20.3	18.5	20.8	17.7	16.1
1995	17.5	15.8	13.8	25.9	20.2	18.4	20.5	17.5	15.9
1996	17.7	16.0	14.0	26.5	20.7	18.8	20.8	17.8	16.2
1997	17.6	15.8	13.8	26.1	20.4	18.5	20.6	17.6	16.0
1998	17.7	16.0	14.0	26.6	20.8	18.9	20.9	17.8	16.2
1999	17.4	15.7	13.7	26.0	20.3	18.4	20.5	17.5	15.9
2000	17.7	16.0	14.0	26.2	20.5	18.6	20.8	17.7	16.1
2001	17.6	15.9	13.9	26.0	20.2	18.4	20.6	17.6	15.9
2002	17.6	15.8	13.8	26.0	20.3	18.5	20.6	17.6	15.9
2003	17.8	16.0	14.0	26.5	20.7	18.8	20.9	17.8	16.2
2004	17.7	15.9	13.9	26.5	20.6	18.8	20.8	17.7	16.1
2005	18.0	16.2	14.2	27.1	21.2	19.2	21.2	18.1	16.5
2006	18.2	16.4	14.3	27.6	21.5	19.5	21.5	18.4	16.7

Note:

Lab = Laboratory fuel economy
Adj1 = .9 and .78 adjustment factor fuel economy estimate
Adj2 = proposed consumer fuel economy estimate revision

Table A-7

Fuel Economy of 1975 to 2006 Vehicles

Both Cars and Trucks

MODEL YEAR	City			Highway			Combined (City/Hwy)		
	Lab	Adj1	Adj2	Lab	Adj1	Adj2	Lab 55/45	Adj1 54/45	Adj2 43/57
1975	13.4	12.0	10.6	18.7	14.6	13.3	15.3	13.1	11.9
1976	14.6	13.2	11.6	20.2	15.7	14.3	16.7	14.2	12.9
1977	15.6	14.0	12.3	21.3	16.6	15.1	17.7	15.1	13.6
1978	16.3	14.7	12.9	22.5	17.5	15.9	18.6	15.8	14.3
1979	16.5	14.9	13.0	22.3	17.4	15.8	18.7	15.9	14.4
1980	19.6	17.6	15.3	27.5	21.5	19.5	22.5	19.2	17.3
1981	20.9	18.8	16.4	29.5	23.0	20.9	24.1	20.5	18.5
1982	21.3	19.2	16.7	30.7	23.9	21.7	24.7	21.1	19.0
1983	21.2	19.0	16.5	30.6	23.9	21.7	24.6	21.0	18.9
1984	21.2	19.1	16.5	30.8	24.0	21.8	24.6	21.0	19.0
1985	21.5	19.3	16.8	31.3	24.4	22.2	25.0	21.3	19.2
1986	22.1	19.9	17.2	32.2	25.1	22.8	25.7	21.9	19.8
1987	22.2	20.0	17.3	32.6	25.5	23.1	25.9	22.1	20.0
1988	22.1	19.9	17.3	32.7	25.5	23.1	25.9	22.1	19.9
1989	21.7	19.5	16.9	32.3	25.2	22.8	25.4	21.7	19.6
1990	21.4	19.3	16.7	32.2	25.1	22.8	25.2	21.5	19.5
1991	21.6	19.4	16.8	32.5	25.3	23.0	25.4	21.7	19.6
1992	21.0	18.9	16.4	32.1	25.0	22.7	24.9	21.3	19.3
1993	21.2	19.1	16.6	32.4	25.2	22.9	25.1	21.4	19.4
1994	20.8	18.7	16.2	31.6	24.7	22.4	24.6	21.0	19.0
1995	20.8	18.8	16.3	32.1	25.0	22.7	24.7	21.1	19.2
1996	20.8	18.7	16.3	32.2	25.1	22.8	24.8	21.2	19.2
1997	20.6	18.6	16.1	31.8	24.8	22.5	24.5	20.9	19.0
1998	20.6	18.5	16.1	31.9	24.9	22.6	24.5	20.9	19.0
1999	20.3	18.3	15.9	31.2	24.4	22.1	24.1	20.6	18.7
2000	20.5	18.4	16.0	31.4	24.5	22.2	24.3	20.7	18.8
2001	20.5	18.4	16.0	31.1	24.3	22.0	24.2	20.7	18.7
2002	20.4	18.3	15.9	30.9	24.1	21.9	24.1	20.6	18.6
2003	20.6	18.5	16.1	31.3	24.4	22.2	24.3	20.8	18.8
2004	20.2	18.2	15.8	31.0	24.2	22.0	24.0	20.5	18.6
2005	20.7	18.7	16.2	31.8	24.8	22.5	24.6	21.0	19.0
2006	20.7	18.6	16.2	31.9	24.9	22.6	24.6	21.0	19.1

Note:

Lab = Laboratory fuel economy
Adj1 = .9 and .78 adjustment factor fuel economy estimate
Adj2 = proposed consumer fuel economy estimate revision